APPENDIX A—MATERIAL SAFETY DATA SHEETS FOR ANHYDROUS AMMONIA AND VANADIUM PENTOXIDE

	KYNOCHEM (PTY) LTD *MATERIAL SAFETY DATA SHEET*	No. 004 Issued: Feb. 1993 Page 1 of 4

AMMONIA ANHYDROUS

1. Identification:

Substance Identification:	Ammonia Anhydrous, Liquid Ammonia
Company Address:	**KYNOCHEM** (Pty) Limited Modderfontein, Gauteng, 1645.
Emergency Telephone Number:	(011)608-3300

2. Composition and Ingredients:

COMPONENT	CONCENTRATION	S-Phase	R-Phase
Ammonia	Ca. 100%	S 7/9	R 10
		S 16	R 23

Risk and Safety Phases according to EC Directive 67/548/ECC

3. Hazards:

Toxic by inhalation.
Vapour is irritant to the respiratory tract.
Both the vapour and the liquid cause irritation to the skin and eyes.
Flammable but not readily ignited.

4. First Aid:

Specific Immediate Treatment

Inhalation:	Remove patient from exposure, keep warm and at rest. Apply artificial respiration if breathing has ceased or shows signs of failing. **OBTAIN IMMEDIATE MEDICAL ATTENTION.**
Skin Contact:	Remove contaminated clothing. Wash with copious amounts of water for 20 minutes. Use safety shower if available. **OBTAIN IMMEDIATE MEDICAL ATTENTION.**
Eye Contact:	Immediately irrigate with clean water, holding the eyelids apart, for at least 20 minutes. **OBTAIN IMMEDIATE MEDICAL ATTENTION.** Continue irrigation until medical attention can be obtained.
Ingestion:	Do not induce vomiting. Wash out mouth with water and give 200-300 ml (half a pint) of water to drink. **OBTAIN IMMEDIATE MEDICAL ATTENTION.**

Further professional Medical Assistance

Symptomatic treatment and supportive therapy as indicated.
Administer oxygen if necessary.
Cold wet compresses should be applied to the affected areas to relieve pain. Following severe exposure the patient should be kept under medical review for at least 48 hours as delayed pulmonary oedema may develop.

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AMMONIA ANHYDROUS

5. Fire Fighting:

FLASH POINT:-	AUTOIGNITION TEMP.:650°C	LEL:16%(v/v)	UEL:27%(v/v)
Flammable. Mixtures are difficult to ignite.			
Requirements for fighting a fire caused by the substance			
Extinguishing media:	In case of fire use water spray. Water spray should be used to cool containers.		
Exposure hazards from combustion:	Combustion evolves toxic and irritant vapours (NH_3 and NO_x).		
Special protective equipment:	A self-contained breathing apparatus and full protective clothing must be worn in fire conditions.		
6. Accidental Release:			
Personal protection:	Evacuate the area.		
Environmental precautions:	Use water curtains downwind to reduce vapour emissions.		
Methods for cleaning up:	For small spillages: drench with water and wash to drain (dilute at least 100 times.) For large spillages: contain and cover with foam.		
7. Handling and Storage:			
Handling Avoid contact with skin and eyes. Do not breathe vapour. Use only in well-ventilated areas. **Storage** Liquid Ammonia should not be confined without adequate vapour space or a pressure relief valve with discharge piped to a safe place.			
8. Exposure and Personal Protection:			
TLV-TWA:17mg/m^3	TLV-STEL:24 mg/m^3	(ACGIH 92 to 93)	
Where exposure to levels above the occupational exposure limit is likely; and engineering controls are either not fitted or are not totally effective, wear suitable respiratory protective equipment. Wear suitable protective clothing, gloves and eye/face protection.			

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AMMONIA ANHYDROUS

9. Physical and Chemical Properties:	
Appearance:	Colourless liquified gas.
Odour:	Characteristically pungent
Boiling Point (°C):	-33.5
Melting Point (°C):	-78
Density (g/cm^3) at 20°C:	0.61
Vapour Pressure (mm Hg):	7600 at 25°C
Vapour Density (Air=1):	0.6
Odour Threshold (ppm):	5-53
Solubility (water):	ca. 33% at ambient
10. Stability and Reactivity:	
Hazardous reactions and decomposition products: Will react with halogens, hypochlorites, mercury, silver, lead and the oxide of nitrogen to form unstable compounds which are liable to explode.	

Keep away from copper, zinc, tin, cadmium and their alloys.	
11. Toxicology:	
Inhalation:	Vapour may cause irritation to the respiratory tract. High atmospheric concentrations in excess of the occupational exposure limit may cause injury to the mucuos membranes. Fluid build up on the lung (pulmonary oedema) may occur up to 48 hours after exposure to extremely high levels and could prove fatal. The onset of the respiartory symptoms may be delayed for several hours after exposure.
Skin Contact:	High concentrations of vapour may cause irritation. By rapid evaporation the liquid may cause frostbite.
Eye Contact:	The vapour is an irritant but the liquid is a severe irritant. Liquid splashes or spray may cause freeze burns. May cause severe damage if eye is not immediately irrigated. The full effect may occur after several days
Ingestion:	Will cause corrosion of and damage to the gastrointestinal tract.
Long Term Exposure:	This material has been in use for many years with no evidence of adverse effects.
12. Ecology:	
Users should ensure that they comply with local, provincial and national environmental legislation. Environmental fate and mobility: No information available. Persistence, degradation and bioaccumulation: No information available Effect on effluent treatment: Toxic to aquatic organisms.	

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AMMONIA ANHYDROUS		
13. Disposal:		
Disposal should be in accordance with local, state or national legislation. Recover, reclaim or recycle if practicable.		
14. Transport:		
Hazchem Code:	2PE	
UN No.:	1005	
IMDG Class:	2 (2.3)	
Proper shipping name:	Ammonia, Anhydrous, Liquefied	
15. Regulations:		
The material is classified as a Group II hazardous substance according to the Hazardous Substances Act, Act 15 of 1973, as amended.		
16. Other:		
All information is given in good faith but without guarantee in respect of accuracy, and no responsibility is accepted for errors or omissions or the consequences thereof. It is the user's obligation to determine the conditions of safe use of the material.		

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MATERIAL SAFETY DATA SHEET ACC24780

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN, NJ 07410 (201) 796-7100

EMERGENCY CONTACT:
GASTON L. PILLORI
(201) 796-7100

SUBSTANCE IDENTIFICATION

CAS-NUMBER 1314-62-1
RTEC-NUMBER YW2450000

SUBSTANCE: **VANADIUM PENTOXIDE**

TRADE NAMES/SYNONYMS:
VANADIC ANHYDRIDE: VANADIUM OXIDE: VANADIC ACID ANHYDRIDE: VANADIUM PENTAOXIDE: C.I. 77938: VANADIUM(V) OXIDE: DIVANADIUM PENTAOXIDE: DIVANADIUM PENTOXIDE: VANADIC OXIDE: VANADIUM OXIDE (V2O5): RCRA P120: STCC 4963385: V-7: 05V2: ACC24780

CHEMICAL FAMILY:
INORGANIC SALT

MOLECULAR FORMULA: V2-O5 MOLECULAR WEIGHT: 181.88

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: VANADIUM PENTOXIDE PERCENT: >98

EXPOSURE LIMIT:
VANADIUM PENTOXIDE:
0.05 MG(V2O5)/M3 OSHA TWA (RESPIRABLE DUST AND FUME)
0.05 MG(V2O5)/M3 ACGIH TWA (RESPIRABLE DUST AND FUME)
0.05 MG(V)/M3 NIOSH RECOMMENDED 15 MINUTE CEILING

100/10,000 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
1000 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY

PHYSICAL DATA

DESCRIPTION: ODORLESS, YELLOW TO RUST-BROWN CRYSTALLINE POWDER.

BOILING POINT: 3182 F (1750 C)
DECOMPOSES MELTING POINT: 1274 F (690 C)

SPECIFIC GRAVITY: 3.357 @ 18 C SOLUBILITY IN WATER: 0.8%

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ACIDS, ALKALIES, ACETIC ANHYDRIDE, ETHYL ACETATE, ACETONE; INSOLUBLE IN ALCOHOL

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FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
NEGLIGIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

OXIDIZER: OXIDIZERS DECOMPOSE, ESPECIALLY WHEN HEATED, TO YIELD OXYGEN OR OTHER GASES WHICH WILL INCREASE THE BURNING RATE OF COMBUSTIBLE MATTER. CONTACT WITH EASILY OXIDIZABLE, ORGANIC, OR OTHER COMBUSTIBLE MATERIALS MAY REGULT IN IGNITION, VIOLENT COMBUSTION OR EXPLOSION.

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. FIGHT FIRE FROM MAXIMUM DISTANCE. STAY AWAY FROM STORAGE TANK ENDS. DIKE FIRE CONTROL WATER FOR LATER DISPOSAL. DO NOT SCATTER MATERIAL (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 55).

EXTINGUISH USING AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING VAPORS OR DUSTS, KEEP UPWIND.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
POISON B

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
POISON

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.365
EXCEPTIONS: 49CFR173.364

TOXICITY

VANADIUM PENTOXIDE:
TOXICITY DATA: 346 MG/M3 INHALATION-HUMAN TCLO; 1 MG/M3/8 HOURS INHALATION-HUMAN TCLO; 70 MG/M3/2 HOURS INHALATION-RAT LCLO; 500 MG/M3/23 MINUTES INHALATION-CAT LCLO; 10 MG/KG ORAL-RAT LD50; 23 MG/KG ORAL-MOUSE LD50; 12 MG/KG INTRAPERITONEAL-RAT LD50; 25 MG/KG INTRATRACHEAL-RAT LDLO; 10 MG/KG INTRAVENOUS-RABBIT LDLO; 14 MG/KG SUBCUTANEOUS-RAT LD50; 10 MG/KG SUBCUTANEOUS-MOUSE LD50; 20 MG/KG SUBCUTANEOUS-RABBIT LDLO; 20 MG/KG SUBCUTANEOUS-GUINEA PIG LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- EYE, SKIN, MUCOUS MEMBRANES.
ACUTE TOXICITY LEVEL: HIGHLY TOXIC BY INGESTION.

TARGET EFFECTS: LACRIMATOR. POISONING MAY ALSO AFFECT THE RESPIRATORY AND GASTROINTESTINAL TRACTS, LIVER, AND KIDNEYS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
VANADIUM PENTOXIDE:
IRRITANT. 70 MG/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF DUST CONCENTRATIONS OF >0.1 MG/M3 MAY RESULT IN RESPIRATORY TRACT IRRITATION, DELAYED SEROUS OR HEMORRHAGIC RHINITIS AND SORE THROAT AND CHEST, OFTEN WITH A LATENT PERIOD OF A HALF TO ONE HOUR, NASOPHARYNGITIS, SNEEZING, DELAYED DRY, PAROXSYMAL COUGH, WHEEZING, AND DYSPNEA ON EXERTION, WITH A LATENT PERIOD OF 6-24 HOURS, TRACHEITIS, EXPECTORATION, BRONCHITIS, BRONCHOSPASMS, RALES AND RHONCHI, PNEUMONITIS, HEMOPTYSIS, AND POSSIBLE PULMONARY SENSITIZATION RESULTING IN ASTHMA. OTHER SYMPTOMS MAY INCLUDE PALLOR, ALTERED TASTE, GREENISH-BLACK DISCOLORATION OF THE TONGUE, HEADACHE, NAUSEA, VOMITING, ABDOMINAL PAIN, INCREASED TEMPERATURE, INSOMNIA, ANOREXIA, WEIGHT LOSS, NERVOUSNESS, DIZZINESS, ANEMIA, TINNITUS, KIDNEY MALFUNCTION, ALBUMINURIA, HEMATURIA, PSYCHIC DISTURBANCES, CARDIAC PALPITATIONS, AND DAMAGE TO THE LIVER AND ADRENALS. OTHER SYMPTOMS OF VANADIUM COMPOUNDS MAY INCLUDE TREMORS OF DISTAL EXTREMITIES, BLINDNESS, AND DAMAGE TO THE BONE MARROW. MORE SEVERE EXPOSURES TO VANADIUM PENTOXIDE MAY RESULT IN PULMONARY EDEMA, PATCHY BRONCHOPNEUMONIA, AND LOBAR PNEUMONIA, WHICH MAY BE FATAL. IF THE VICTIM SURVIVES, THERE MAY BE PERSISTENT ASTHMA-TYPE BRONCHITIS, BOUTS OF DYSPNEA, AND FATIGUE. ONCE REMOVED FROM EXPOSURE, COMPLETE RECOVERY USUALLY OCCURS WITHIN 1-2 WEEKS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY RESULT IN CHRONIC BRONCHITIS WITH OR WITHOUT EMPHYSEMA, HIGH BLOOD PRESSURE, AND OTHER EFFECTS AS IN ACUTE EXPOSURE. THERE MAY ALSO BE BLOOD CHANGES, LIVER AND KIDNEY DAMAGE, AND AN INCREASED SUSCEPTIBILITY TO RESPIRATORY CHANGES.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
VANADIUM PENTOXIDE:
IRRITANT.
ACUTE EXPOSURE- DIRECT CONTACT WITH AIR CONCENTRATIONS OF GREATER THAN OR EQUAL TO 0.03 MG V/M3 MAY RESULT IN IRRITATION, A SEBORRHEA-LIKE ECZEMA WITH INTENSE ITCHING, GENERALIZED URTICARIA, AND POSSIBLE SENSITIZATION RESULTING IN CONTACT DERMATITIS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY RESULT IN ALLERGIC ECZEMA, SENSITIZATION, AND DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
VANADIUM PENTOXIDE:

IRRITANT/LACRIMATOR.
ACUTE EXPOSURE- DIRECT CONTACT WITH AIR CONCENTRATIONS OF GREATER THAN OR EQUAL TO 0.018 MG V/M3 MAY RESULT IN IRRITATION, PROFUSE LACRIMATION, BLURRED VISION, AND A BURNING SENSATION OF THE CONJUNCTIVA.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
VANADIUM PENTOXIDE:
HIGHLY TOXIC.
ACUTE EXPOSURE- INGESTION MAY CAUSE A METALLIC TASTE, NAUSEA, VOMITING, ABDOMINAL PAIN AND SPASMS, DIARRHEA, AND GREENISH-BLACK DISCOLORATION OF THE TONGUE. INGESTION OF VANADIUM BY RATS RESULTED IN IMMEDIATE DISTRESS, HEMORRHAGIC RHINITIS, MARKED DIARRHEA, HINDLIMB PARALYSIS, DYSPNEA, CONVULSIONS, AND DEATH. PATHOLOGICAL FINDINGS IN ANIMALS MAY INCLUDE DAMAGE TO THE LIVER, KIDNEYS, LUNGS, GASTROINTESTINAL TRACT, ADRENAL CORTEX, BRAIN, SPINAL CORD, AND BONE MARROW.
CHRONIC EXPOSURE- REPEATED OR PROLONGED INGESTION MAY RESULT IN THE SAME EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- GIVE ONE GRAM PER DAY ORALLY OF ASCORBIC ACID. CALCIUM EDETATE MAY BE USEFUL (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). GET MEDICAL ATTENTION.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

POISONING FROM VANDIUM COMPOUNDS:
GIVE ASCORBIC ACID, 1 GRAM/DAY. CALCIUM DISODIUM EDETATE MAY BE USEFUL. IT IS AVAILABLE AS 5 ML AMPULES OF A 20% SOLUTION. GIVE 15-25 MG/KG (0.08-0.125 ML OF 20% SOLUTION PER KILOGRAM OF BODY WEIGHT) IN 250-500 ML OF 5% DEXTROSE INTRAVENOUSLY OVER A 1 TO 2 HOUR PERIOD TWICE DAILY. THE MAXIMUM DOSE SHOULD NOT EXCEED 50 MG/KG/DAY. THE DRUG SHOULD BE GIVEN IN 5-DAY COURSES. AFTER THE FIRST COURSE, SUBSEQUENT COURSES SHOULD NOT EXCEED 50 MG/KG/DAY. DAILY URINALYSES SHOULD BE DONE DURING THE TREATMENT PERIOD. THE DOSAGE SHOULD BE REDUCED IF ANY UNUSUAL URINARY FINDINGS APPEAR. INTRAVENOUS ADMINISTRATION IS CONTRAINDICATED IN THE PRESENCE OF ELEVATED CEREBROSPINAL FLUID PRESSURE.
FOR INTRAMUSCULAR ADMINISTRATION, GIVE 20% SOLUTION (200 MG/ML), 12.5 MG/KG BODY WEIGHT EVERY 4-6 HOURS. DILUTE EACH DOSE WITH AN EQUAL VOLUME OF 1% PROCAINE. DOSE LIMITATION IS THE SAME AS THAT GIVEN ABOVE (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
VANADIUM PENTOXIDE:
CALCIUM, SULFUR, WATER: FORMATION OF AN EXPLOSIVE COMPOUND.

CHLORINE TRIFUORIDE: VIOLENT REACTION.
LITHIUM: INTENSE EXOTHERMIC REACTION.
ORGANIC MATERIALS: POSSIBLE FIRE AND EXPLOSION HAZARD.
PEROXYFORMIC ACID: VIOLENT DECOMPOSITION.

DECOMPOSITION:
THERMAL DECOMPOSITION MAY RELEASE ACRID SMOKE AND TOXIC FUMES OF VANADIUM OXIDES.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER P120.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINERS MAY EXPLODE IN HEAT OF FIRE.

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS PIT, POND OR LAGOON TO CONTAIN SPILLED MATERIAL. USE PROTECTIVE COVER SUCH AS A PLASTIC SHEET TO PREVENT DISSOLVING IN FIREFIGHTING WATER OR RAIN.

WATER-SPILL:
NEUTRALIZE WITH AGRICULTURAL LIME, SLAKED LIME, CRUSHED LIMESTONE OR SODIUM BICARBONATE.

ALLOW SPILLED MATERIAL TO AERATE.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

OCCUPATIONAL-SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINERS AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

VANADIUM, AS VANADIUM PENTOXIDE (V205):

DUST OR FUME:

0.5 MG/M3- ANY AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

1.25 MG/M3- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

2.5 MG/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING

FACEPIECE AND A HIGH-EFFICIENCY PARTICULATE FILTER.

70 MG/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED BY: FISHER SCIENTIFIC

CREATION DATE: 11/14/84 REVISION DATE: 10/13/89

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